Comparison of Soil Information System and Field Data to Measure Soil Organic Carbon

Gustavo M. Vasques[1], Nicholas DiGruttolo[1] and Sabine Grunwald[1]
[1]Soil and Water Science Department, University of Florida, Gainesville, FL, USA

ABSTRACT

Estimates based on State Soil Geographic (STATSGO) database indicate that Florida soils store between 1,686 and 8,734 million metric tons of organic carbon. The range of these estimates reflects the uncertainty that originates from soil survey information system. The variability of soil properties within map units (polygons), represented by the *components*, is not easily accounted for. Therefore, when accurate assessments of soil carbon stocks across larger regions are needed, usually some form of generalization based on the available soil survey datasets is required.

We present a case study where soil organic carbon (SOC) stock was estimated in a 3,585-km^2 watershed in Florida using different mapping techniques that were based on Soil Data Mart data, independent field observations, or both. Our objective was to explore different approaches to integrate readily available Soil Data Mart data with field data to improve estimates of SOC, at the same time comparing the different outputs, and acknowledging the assumptions and limitations of each technique.

We compared the following approaches to assess SOC stocks across the watershed: (i) Derive SOC from Soil Data Mart data; (ii) Derive SOC from STATSGO data; (iii) Use field-mapped SOC and GIS data layers of land use and soil orders to develop a class pedotransfer function that was used to predict SOC across the watershed; (iv) Use field-mapped SOC and Soil Data Mart soil series to develop a class pedotransfer function that was used to predict SOC across the watershed; and (v) Use ordinary kriging to derive SOC from field observations.

The within-polygon variability of Soil Data Mart can be explained to a certain extent by incorporating auxiliary environmental data (e.g. derived using GIS and remote sensing layers and/or field data). On the other hand, maps created based on field observations can be improved when soil survey information is integrated in the modeling framework. Therefore, use of both types of data might be the most promising approach.

Interestingly, the output SOC maps and stocks reflect the choice of input data and mapping techniques; thus can be observed critically in a good exercise of the advantages and disadvantages of the different combinations of data and technique. The challenge is to identify to what degree the different input data (Soil Data Mart versus field observations) contribute to the quality of the final output maps and total SOC stock estimates.

Contact Information: Gustavo M. Vasques, Soil and Water Science Department, University of Florida, 1184 McCarty Hall, P.O. Box 110290, Gainesville, FL 32611, USA, Phone: 352-392-1951 ext. 233; Fax: 352-392-3902, Email: gvasques@ufl.edu